STRATIFICATION AND PHENOLOGY OF A WOODLAND HETEROPTERA ASSEMBLAGE IN SOUTHERN BRITAIN

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Abstract

The Heteroptera collected by Malaise traps placed at ground level and in the canopy of a birch woodland are presented, and the assemblage compared to that obtained in the same woodland by a combination of beating-bag and D-Vac samples. The two methodologies produced a broadly similar result, and revealed that the assemblage was highly stratified between tree dwelling and epigeal species. The phenology of the assemblage showed a peak in autumn, unlike the groups previously studied in this woodland.

Introduction

The Heteroptera are a relatively small group, but they exhibit a wide range of feeding strategies (Southwood & Leston, 1959). Most are found on plants, although there are some epigeal species, and they are known to respond to changes in vegetation structure as well as composition (Dolling, 1991).

In 1991, as part of a study of canopy insects, Malaise traps were placed in an area of birch woodland (Hollier & Belshaw, 1993). The adult Heteroptera were identified, providing information about the phenology and stratification of the assemblage. Since this woodland had been sampled for Heteroptera some 14 years earlier using a combination of beating-bag and D-vac suction sampling to collect both canopy and field layer or ground-dwelling insects (Southwood *et al.*, 1979), the Malaise trap data also allow comparison of the two sampling regimes and possible successional changes in the assemblage.

Methods

The study was carried out at Silwood Park, Sunninghill, Berkshire, during the summer of 1991. The site was an area of 70 year old birch woodland that enclosed a number of older oak and beech trees which had formed part of the park. The woodland edge, where it abutted grassland, had a band of bracken but the interior of the woodland had a very sparse vegetation. The site has been described in some detail in Southwood *et al.* (1979).

Two pairs of Malaise traps were set up near the edge of this woodland, one pair on the ground, the other pair on the wooden platforms at the top of the 6m high scaffolding towers used by Southwood *et al.* (1979). The traps on top of the towers were in the lower canopy of the birch, and one of the traps projected above the canopy of a storm-damaged beech. The traps on the ground were some 5 m to the side of each tower; all traps had the same orientation and an effective entrance height of about 1m. The traps were operated from May to September inclusive, the captured material being removed monthly. Sampling in 1977 was a combination of beating-bag and D-vac sampling (Southwood *et al.*, 1979) which collected insects in the canopy, field and ground layers; these data are compared with the Malaise trap catches.

Results and discussion

Assemblage composition

A total of 4445 adult Heteroptera, of 40 species, were identified from the Malaise traps (see Table 1). Perhaps unsurprisingly, the assemblage was dominated by the eight species associated with birch in Britain (Nau, 1992), all of which were present in the samples. Birch-associated species accounted for 4197 (94%) of the individuals and seven of the ten most abundant species (see Table 2). The very low abundance of 'tourists' (species primarily associated with other habitats or host plants) was notable given that Malaise traps are interception traps; this phenomenon was also noted for the Auchenorrhyncha however (Hollier, 2004).

Several of the species abundant in the earlier sampling were rare in the Malaise trap samples (see Table 2); given that these were the epigeal *Stygnocoris sabulosus* (Schilling) and *Drymus sylvaticus* (Fabr.), and the tiny predatory *Myrmedobia distinguenda* Reuter, the females of which are micropterous, this is clearly the consequence of a systematic sampling bias.

The abundance of *Psallus varians* (Herrich-Schaeffer) and *P. perrisi* (Mulsant & Rey), normally associated with oak, in both sets of samples was unexpected, especially given the otherwise low number of 'tourists'. It is possible that these species are able to use beech as an alternative host plant.

A single species, *Kleidocerys resedae* (Panzer), accounted for 3660 (82%) of the Heteroptera captured in the Malaise traps. This species feeds on the seeds developing in birch and alder catkins and over-winters as an adult. Hibernation is generally away from the host plant and *K. resedae* is consequently often abundant on other plants, for example it was the third most abundant species in a fogging study of oak trees (Dolling, 1985). The dominance of *K. resedae* means that the equitability of the assemblages is low, particularly for the ground samples. The overall pattern is similar to the D-vac and beating-bag samples, as Fig. 1 shows.

Stratification

There was little difference in species abundance between the canopy and ground traps, except that *Monalocoris filicis* (L.), a species associated with bracken in the field layer, was more abundant in the ground traps. Given the paucity of the field layer, especially deeper in the woodland, this is not particularly surprising, although several grass-feeding species of Auchenorrhyncha were taken in the ground level traps. As noted above however, there is a very large difference between the two sampling methods, and the assemblage is strongly stratified between arboreal and epigeal species. The canopy samples were significantly more diverse than the ground samples (canopy and ground Shannon Indices 1.37 and 0.60, respectively). The D-Vac and beating-bag samples were significantly more diverse than either canopy or the combined Malaise trap samples (D-vac and beating Shannon Index 1.84, combined Malaise samples Shannon Index 0.89).

Phenology

The phenology of the assemblage was similar for ground and canopy samples, as Fig. 2 shows. The increase towards the end of the sampling season was very different from the pattern seen in both Neuroptera and Auchenorrhyncha (Hollier & Belshaw,

Table 1. The number of each species captured in the canopy and ground level Malaise traps in birch woodland at Silwood Park, Ascot, in 1991.

	Canopy		Ground	
	East	West	East	West
Acanthosomatidae				
Elasmostethus interstinctus (L.)	64	76	93	36
Elasmucha grisea (L.)	4	1	5	7
Anthocoridae				
Anthocoris confusus Reuter	1	5	10	8
Anthocoris nemoralis (Fabr.)	10	25	18	12
Anthocoris nemorum (L.)			1	
Orius niger (Wolff)	1	1		3
Lygaeidae				
Drymus brunneus (Sahlberg)				1
Kleidocerys resedae (Panzer)	332	628	1458	1242
Peritrechus geniculatus (Hahn)				1
Scolopstethus thomsoni Reuter				1
Microphysidae				
Loricula elegantula (Baerensprung)	1	1	1	1
Myrmedobia coleoptrata (Fallén)			1	
Miridae				
Blepharidopterus angulatus (Fallén)	44	27	14	7
Campyloneura virgula (Herrich-Schaeffer)	1	8		4
Deraeocoris lutescens (Schilling)	1	1		
Dryophilocoris flavoquadrimaculatus (De Geer)			1	1
Harpocera thoracica (Fallén)		1	1	
Lopus decolor (Fallén)	1			
Lygocoris contaminatus (Fallén)	20	27	23	18
Miris striatus (L.)				2
Monalocoris filicis (L.)	5	2	8	2
Orthotylus marginalis Reuter	1			
Pantilius tunicatus (Fabr.)	3	9	1	1
Phylus melanocephalus (L.)	1			
Phytocoris dimidiatus Kirschbaum		4		1
Phytocoris longipennis Flor	1			1
Phytocoris tiliae (Fabr.)	7	7	1	1
Plagiognathus arbustorum (Fabr.)				1
Plagiognathus chrysanthemi (Wolff)	1			
Psallus ambiguus (Fallén)				2
Psallus betuleti (Fallén)	13	2	4	
Psallus falleni Reuter	22	12	3	1
Psallus haematodes (Gmelin)			1	
Psallus perrisi (Mulsant & Rey)		14	15	20
Psallus quercus (Kirschbaum)	2			
Psallus varians (Herrich-Schaeffer)	3	12		
Rhabdomiris striatellus (Fabr.)	3		1	
Salicarus roseri (Herrich-Schaeffer)		1		
Pentatomidae				
Eurydema oleracea (L.)				2
Pentatoma rufipes (L.)		1		2
Number of individuals	542	865	1660	1378
Number of species	24	22	20	26

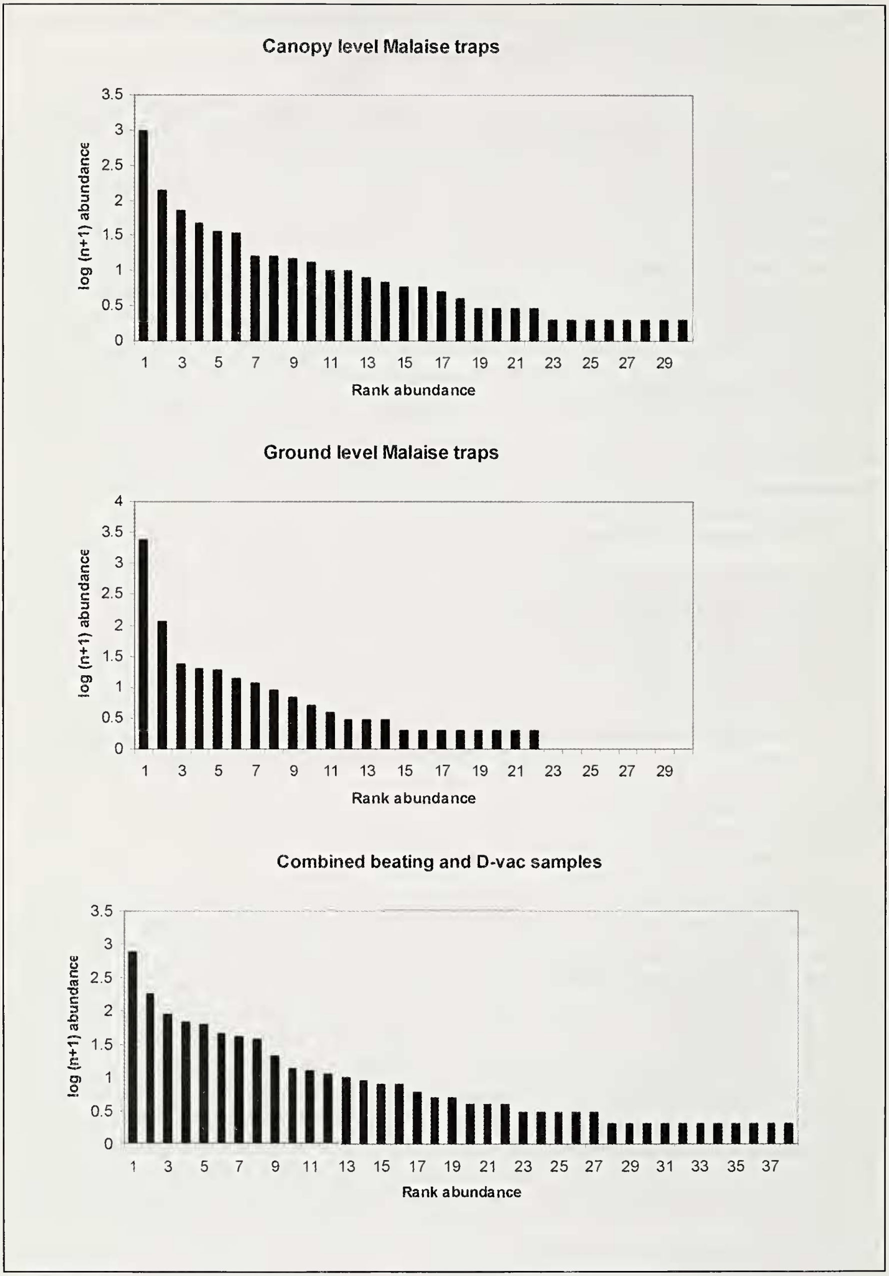

Figure 1. Rank abundance (log (n + 1)) of species captured in canopy and ground level Malaise traps in birch woodland at Silwood Park in 1991, and in combined beating and D-Vac samples in the same woodland in 1977.

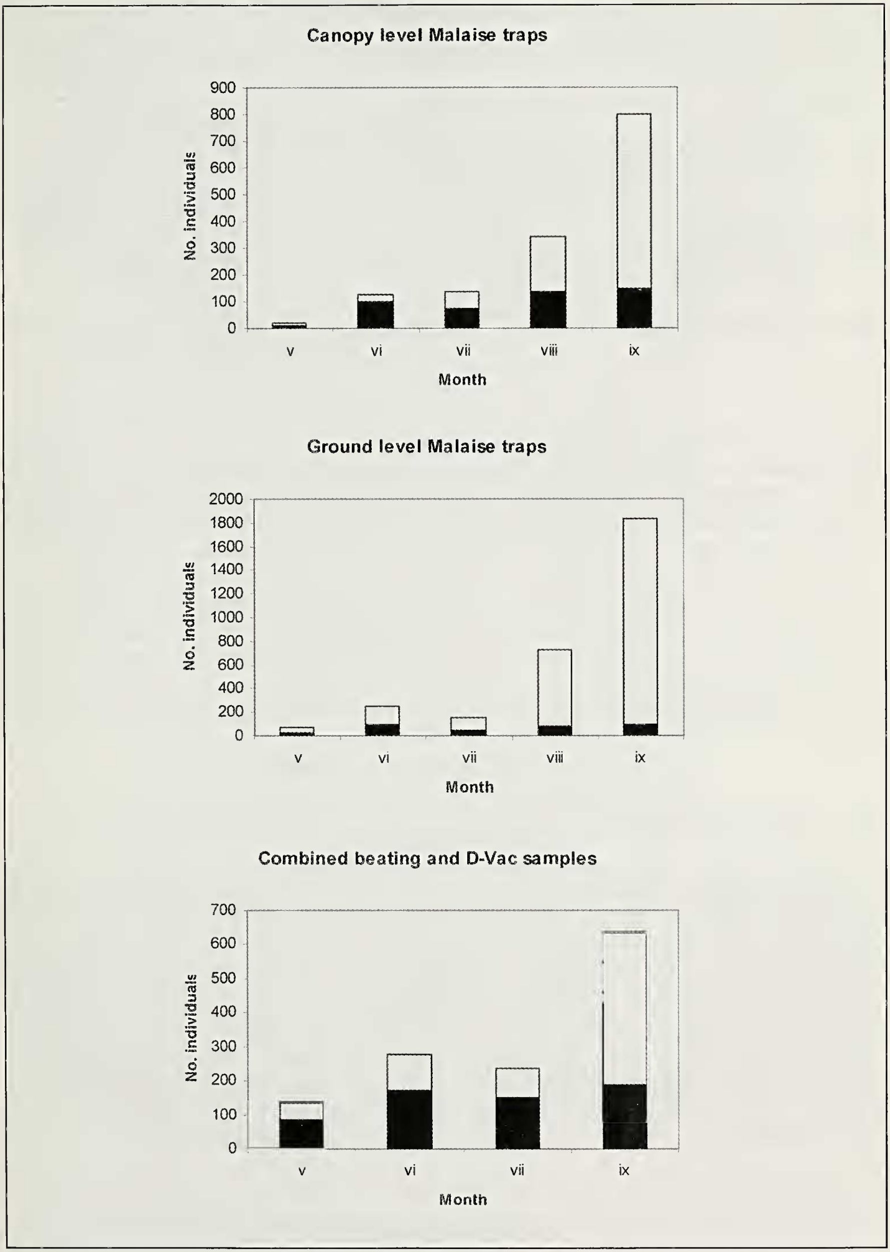

Figure 2. Number of individuals of *Kleidocerys resedae* (open bars) and other species (solid bars) captured in each month in canopy and ground level Malaise traps in birch woodland at Silwood Park in 1991, and in combined beating and D-Vac samples in the same woodland in 1977.

Table 2. Species in rank order of abundance in samples (nomenclature follows Aukema (2005)).

Rank	Canopy Malaise traps	Ground Malaise traps	Beating & D-vac samples
1	*Kleidocerys resedae*	*Kleidocerys resedae*	*Kleidocerys resedae*
2	*Elasmostethus interstinctus*	*Elasmostethus interstinctus*	*Stygnocoris sabulosus*
3	*Lygocoris contaminatus*	*Lygocoris contaminatus*	*Lygocoris contaminatus*
4	*Blepharidopterus angulatus*	*Anthocoris nemoralis*	*Myrmedobia distinguenda*
5	*Anthocoris nemoralis*	*Blepharidopterus angulatus*	*Blepharidopterus angulatus*
6	*Psallus falleni*	*Psallus perrisi*	*Elasmostethus interstinctus*
7	*Psallus betuleti*	*Anthocoris confusus*	*Monalocoris filicis*
8	*Psallus varians*	*Elasmucha grisea*	*Drymus brunneus*
9	*Phytocoris tiliae*	*Monalocoris filicis*	*Psallus varians*
10	*Pantilius tunicatus*	*Campyloneura virgula*	*Anthocoris confusus*

1993; Hollier, 2004), where peaks occurred earlier in the season, followed by a tailing off in numbers. Given the dominance in the assemblage of *K. resedae*, which is known to disperse in large numbers in autumn, this might be regarded as another artefact of the sampling method. As the figure shows however, the pattern is the same in the D-vac and beating-bag samples. Even after *K. resedae* is excluded, the phenology remains distinct from that observed for the other groups, possibly because of the mix of feeding strategies exhibited by the Heteroptera. Unlike the Auchenorrhyncha, which feed primarily on growing buds, leaves and shoots, or the Neuroptera which prey primarily on soft-bodied invertebrates feeding in this way, the Heteroptera includes partially predacious species as well as seed feeders and more generalist predators, and are thus not so closely tied to the period of leaf growth.

Conclusions

The Heteroptera captured belonged to a number of feeding guilds (Moran & Southwood, 1982). The herbivores were overwhelmingly stenophagous on the plants dominating the area sampled, a situation similar to that shown by Brown and Hyman (1986) for phytophagous Coleoptera. The predators were more generalist, although species such as *Anthocoris confusus* Reuter and *Myrmedobia distinguenda* are strongly associated with trees. The assemblage was highly stratified, with an epigeal component as well as *Monalocoris filicis* from the field layer and the tree dwelling species. The assemblage had very few ‘tourists’, notwithstanding the fact that interception traps were used, which suggests that the Heteroptera are strongly habitat specific.

Acknowledgements

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SHORT COMMUNICATION

Further records of *Brachycarinus tigrinus* (Schilling) (Hemiptera: Rhopalidae).–This distinctive and pretty bug was described new to Britain in 2003 from two specimens found in Battersea Park, central London (Jones, R.A. 2004. *British Journal of Entomology and Natural History* **17**: 137–141). It later appeared in Essex (Harvey, P. & Bowdrey, J. 2006. *Essex Naturalist, New series* **23**: 39–40). Therefore readers will not be surprised to learn that it has started to appear at several other sites in the Thames Estuary area. I swept one specimen at Swanscombe Marshes, W. Kent, TQ605765, on 21.vi.2006, at a field meeting organized by Buglife, the Invertebrate Conservation Trust as part of the "All of a buzz in the Thames Gateway" study of brownfield sites. Several specimens were swept by myself and Mark Telfer on a visit to Thames Barrier Park East, S. Essex, TQ413800, on 13.ix.2006. I also swept another rhopalid bug, *Liorhyssus hyalinus* (Fab.). Later that same day I swept a specimen of *Brachycarinus* at Southfields, Belvedere, W. Kent, TQ501800; and another was found in Woolwich, W. Kent, TQ412785. This last specimen was found on the outside of the car window as we were driving back through south London. It must have just landed, shortly before we spotted it, because a few minutes earlier we had been driving at 40–50 mph and the bug would have been unable to land at that speed. The traffic slowed almost to a standstill in Woolwich. Luckily I was able to wind the window down slightly, grab the bug in my fingers and drop it into a water bottle passed to me by Mark.–Richard A. Jones, 135 Friern Road, East Dulwich, London SE22 0AZ (bugmanjones@hotmail.com)